

John M. Guynn

From: Randy Smith [rsmith@earthshell.com]
Sent: Saturday, September 17, 2005 6:09 PM
To: John M. Guynn
Subject: FW: UPDATE: Wrap Model 005
Attachments: Wrap Model - Rev 005 040501.xls

John:

Please let me know if you need any more information. There is a lot more.

RAS

From: Matt Loos
Sent: Friday, April 06, 2001 10:05 AM
To: Donna Balinkie; John Nevling; Randy Smith; Kishan Khemani
Cc: Matt Loos; Scott Houston
Subject: UPDATE: Wrap Model 005

Folks,

Yesterday afternoon, Simon requested that I insert an additional tab to reflect the economics of substituting PLA for Biomax, using the Wrap L Biomax/Ecoflex formulation.

I would appreciate your review and comments.

Thank you,
Matt

9/19/2005

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Biodegradable Wrap Model

Version changes listed by date (most recent at top)

Color Key

Assumptions link/Input	Light Yellow
Linked to another tab	Turquoise (Color Scheme just under Turquoise)
Calculated	Lavender (Color Scheme just to the left of Lavender)
Drives a link to a tab	Light Green

Version 005 04-05-01 - Matt Loos

- 1- Added additional tab to reflect replacing Ecomax with Eastar
- 2- Updated General Assumptions for Eastar and new tab
- 3- Input notes regarding freight and duty assumptions on Ecoflex
- 4- Updated Exchange rates
- 5- Added additional tab to reflect replacing Biomax with PLA
- 6- Updated General Assumption for PLA and new tab

7-

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12-

Version 004 03-09-01 - Matt Loos

Version 003 02-20-01 - Matt Loos

Version 002 11-27-00 - Matt Loos

Version 001 11-13-00 - Matt Loos

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Issues

- 1- What about vendor efficiencies? What are the Throughput assumptions.
- 2- Seek vendors that allow Blowing, Slitting, Printing & Winding as one process.
- 3- At this point, none of these steps are optimized
- 4-
- 5-
- 6-
- 7-
- 8-
- 9-
- 10-
- 11-
- 12-
- 13-

Distribution - Internal Review - 02/28/01 - integral to wrap team

- A) Business Plan - Simon
 - Bagkraft / Bourroughs
 - Apply technology / single laminate material
- B) Blowing, Printing, Sheeting, Slitting to \$0.30 per pound - Randy
 - requires formula to be 'locked-in'
 - Transamerican blowing capacity is 4500MT/year, OR 1/3 of printing capacity
- C) Discussion with Dupont and BASF for 'cocktail' - Simon (Donna)
 - Compounding in-line at the source

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Biodegradable Wrap Model

Comparison Summary with Commercial Volume Pricing

PRODUCT	MATERIAL	BASIS WT (gm/sqM)	WRAP WT (gm)	WRAP SIZE	Avg \$/sqM	\$/LB	Avg \$/1000
Current							
Famous/Big 4-Way	20#/24# Plastawrap	39.5	4.6	14 1/4"x13"	2.62	1.22	12.31
Western/Super 4-Way	20#/24# Plastawrap	39.5	5.6	15"x15"	2.57	1.20	14.70
Special/Burger Promo	20#/24# Plastawrap	39.5	5.6	15"x15"	2.62	1.20	14.99
Crispy Chickn Paper 4-Way	20#/24# Plastawrap	39.5	5.6	15"x15"	2.62	1.14	14.97
Chicken 4 Way Paper	20#/24# Plastawrap	39.5	4.5	13 1/2"x13"	2.86	1.18	11.82
Hamb/Chsbrgr/Fish/Promo	15#/18# Plastawrap			12 1/2"x13"			7.63
Sunrise/Burrito Foil	.00025/14# Paper (Foil)			10 1/2"x 11"			11.92
Typical High Quality Burger Wrap w/ Graphic	20#/24# Plastawrap	39.5	5.6	15" x 15"	2.62	1.20	14.99
Proposed							
Sandwich Wrap A - Biomax/Ecoflex, printed, 30 micron	See Wrap A tab		6.1	15" x 15"	3.18	1.35	18.18
Sandwich Wrap L - Biomax/Eastar - 50 micron	See Wrap L-Biomax/Eastar tab		5.1	15" x 15"	2.94	1.50	16.79
Sandwich Wrap L - PLA/Ecoflex - 50 micron	See Wrap L-PLA/Ecoflex tab		5.1	15" x 15"	2.54	1.29	14.50
Sandwich Wrap L - Biomax/Ecoflex - 50 micron	See Wrap L-Biomax/Ecoflex tab		5.1	15" x 15"	2.54	1.29	14.50

Notes:
Quick White (Collar)

16#/FC807

12"x12"

4.17

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Biodegradable Wrap Model

Assumptions:

Assumption	Value	Units	Detail Description	Assumption Confidence	Open items and assignments
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I. MODEL DESCRIPTION

Review 4 different Wrap formulations

2 formulations (A, L-BiomaxEcoflex) based upon Ecoflex/Biomax

1 formulation (L-BiomaxEaster) based upon Easter MW/Biomax

1 formulation (L-PLAEcoflex) based upon Ecoflex/PLA

II. PRODUCT CONFIGURATION

Sandwich Wrap A - Biomax/Ecoflex, printed, 30 micron	15" x 15"	Ecomax 20/80, 3% SiO2, 5% TiO2, 25% CaCO2 filled, white, printed 4 colors, 30 micron
Sandwich Wrap L - Biomax/Ecoflex - 50 micron	15" x 15"	50% Biomax - 4026, 15% Ecoflex / 35% Filler - ES4336
Sandwich Wrap L - Biomax/Easter - 50 micron	15" x 15"	50% Biomax - 4026, 15% Easter MW / 35% Filler - ES4338
Sandwich Wrap L - PLA/Ecoflex - 50 micron	15" x 15"	50% PLA, 15% Ecoflex / 35% Filler - ES4336

III. PRODUCT FORMULATION (Weight mix ratios)

All formulations (weight mix ratios) are controlled on the respective Wrap presentation tabs

Wrap thickness (microns) is related to weight, but model drives from weight (grams) only.

Bioplast GF 105/30/W20

Ecoflex FBX	66.01%	% of Total Bioplast GF 105/30/W20
PLA - Germany	28.29%	% of Total Bioplast GF 105/30/W20
Slipping Agent	0.94%	% of Total Bioplast GF 105/30/W20
Loxamid	33.33%	% of Total Slipping Agent
Loxiol	33.33%	% of Total Slipping Agent
K21	33.33%	% of Total Slipping Agent
Masterbatch white	4.76%	% of Total Bioplast GF 105/30/W20

Sandwich Wrap A - Biomax/Ecoflex, printed, 30 micron

Total Wrap Weight	6.10	grams
Biomax 6926	80%	%
		% of Biomax + Ecoflex

5.4grams theoretical weight - Randy @ 02/23/01

5.1g current weight - Randy @ 02/23/01

5.83 without ink weight - Randy @ 02/23/01

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Biodegradable Wrap Model

Assumptions:

<u>Assumption</u>	<u>Value</u>	<u>Units</u>	<u>Detail Description</u>	<u>Assumption Confidence</u>	<u>Open items and assignments</u>
Ecoflex FBX	20%	%	% of Biomax + Ecoflex		
Talc - SiO2	3.0%	%	% of Total Wrap Weight		
Whitener - TiO2	5.0%	%	% of Total Wrap Weight		
Limestone - CaCO2	25.0%	%	% of Total Wrap Weight		
Sandwich Wrap L - Biomax/Ecoflex - 50 micron					
Total Wrap Weight	5.10	grams			
Raw Materials:					
Biomax 6926	50%	%	% of Total Wrap Weight		
Ecoflex FBX	15%	%	% of Total Wrap Weight		
Filler - Assume CaCO2	35%	%	% of Total Wrap Weight		
Formulation:					
Biomax 6926	50%	%	% of Total Wrap Weight		
PaperMatch ES4338	50%	%	% of Total Wrap Weight		
Sandwich Wrap L - Biomax/Eastar - 50 micron					
Total Wrap Weight	5.10	grams			
Raw Materials:					
Biomax 6926	50%	%	% of Total Wrap Weight		
Eastar MW - H	15%	%	% of Total Wrap Weight		
Filler - Assume CaCO2	35%	%	% of Total Wrap Weight		
Formulation:					
Biomax 6926	50%	%	% of Total Wrap Weight		
PaperMatch ES4338	50%	%	% of Total Wrap Weight		
Sandwich Wrap L - PLA/Ecoflex - 50 micron					
Total Wrap Weight	5.10	grams			
Raw Materials:					
PLA - Hycail B.V.	50%	%	% of Total Wrap Weight		
Ecoflex FBX	15%	%	% of Total Wrap Weight		
Filler - Assume CaCO2	35%	%	% of Total Wrap Weight		
Formulation:					
PLA - Hycail B.V.	50%	%	% of Total Wrap Weight		
PaperMatch ES4338	50%	%	% of Total Wrap Weight		

IV. RAW MATERIALS PRICING (FOB vendor)

<u>Low Volume</u>					
Inorganics					
Anti-block - SiO2	\$	0.14	\$/lb.	95%	
Whitener - TiO2	\$	0.99	\$/lb.	95%	
Inorganic Filler - CaCO3	\$	0.05	\$/lb.	95%	

Resin

Product design still not finalized.

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Biodegradable Wrap Model

Assumptions:

Assumption	Value	Units	Detail Description	Assumption Confidence	Open items and assignments
Biomax 4026 - DuPont (Rigid)	\$ 1.18	\$/lb.	\$1.18 initial verbal quote provided by DuPont	50%	
Ecoflex FBX - BASF (Flexible)	\$ 5.80	DM/kg	Provided by H.Schmidt - 02/22/01		
Ecoflex FBX - BASF (Flexible)	\$ 1.20	\$/lb.	Assumes 'delivered price'		
Eastar MW - H	\$ 2.00	\$/lb.	High Grade - Provided by Kishan. Assumes 'delivered price'	90%	
Eastar MW - L	\$ 1.83	\$/lb.	Low Grade - Provided by Kishan. Assumes 'delivered price'	90%	
PLA - Hycail B.V. (Rigid)	\$ 1.00	\$/lb.	Provided by Kishan - verbal quote from Bill Kelly. Hycail U.S. prices not yet available		
Masterbatch Compounding by A. Schulman ES4228	\$ 0.75	\$/lb.	Proprietary - A.Schulman Inc.		Randy
% Filler - Assume CaCO3	70%		% of respective Masterbatch		
Masterbatch Compounding by Biotec					
Bioplast GF 105/30/W20	\$ 7.50	DM/kg	Biotec Sales price = 6.22DM Raw Mat. + 1.28DM Compounding	95%	
Bioplast GF 105/30/W20	\$ 1.55	\$/lb.			
PLA - Germany	6.63	DM/kg	Provided by H.Schmidt - 02/22/01		
PLA - Germany	\$ 1.37	\$/lb.			
Loxamid (Slipping Agent)	11.80	DM/kg	Provided by H.Schmidt - 02/22/01		
Loxamid (Slipping Agent)	\$ 2.45	\$/lb.			
Loxol (Slipping Agent)	5.35	DM/kg	Provided by H.Schmidt - 02/22/01		
Loxol (Slipping Agent)	\$ 1.11	\$/lb.			
K21 (Slipping Agent)	11.48	DM/kg	Provided by H.Schmidt - 02/22/01		
K21 (Slipping Agent)	\$ 2.38	\$/lb.			
Masterbatch white	9.00	DM/kg	Provided by H.Schmidt - 02/22/01		
Masterbatch white	\$ 1.97	\$/lb.			

BASF Proprietary composition; Consists mostly of TiO2 (60%??) and Ecoflex (40%??), but there is most likely other trace additives.

	Derived Total raw material cost excluding compounding cost
Bioplast GF 105/30/W20	\$ 1.290 \$/lb.
Ecoflex FBX	\$ 0.794 \$/lb.
PLA	\$ 0.389 \$/lb.
Slipping Agent	\$ 0.019 \$/lb.
Loxamid	\$ 0.065 \$/lb.
Loxol	\$ 0.003 \$/lb.
K21	\$ 0.037 \$/lb.
Masterbatch white	\$ 0.089 \$/lb.

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Biodegradable Wrap Model

Assumptions:

<u>Assumption</u>	<u>Value</u>	<u>Units</u>	<u>Detail Description</u>	<u>Assumption Confidence</u>	<u>Open items and assignments</u>
Masterbatch Compounding by Techmer PM					
Ecoflex / 55% CaCO3	\$ 1.85	1,000 lbs \$/lb.	Kishan Memo - 11/06/00	95%	Masterbatch compounding costs will remain relatively high without competition
% CaCO3	55.0%		% of respective Masterbatch		
Ecoflex / 64% TiO2/BaSO4	\$ 2.05	\$/lb.	Kishan Memo - 11/06/00	95%	
% TiO2/BaSO4	64.0%		% of respective Masterbatch		
Ecoflex / (Assume) 60% SiO2	\$ 1.90	\$/lb.	Kishan Memo - 11/06/00	95%	
% TiO2	60.0%		% of respective Masterbatch		
Biomax / 61% CaCO3	\$ 1.90	\$/lb.	Kishan Memo - 11/06/00	95%	
% CaCO3	61.0%		% of respective Masterbatch		
Biomax / 53% TiO2/BaSO4	\$ 2.10	\$/lb.	Kishan Memo - 11/06/00	95%	
% TiO2/BaSO4	53.0%		% of respective Masterbatch		
Biomax / 50% SiO2	\$ 2.02	\$/lb.	Kishan Memo - 11/06/00	95%	
% SiO2	50.0%		% of respective Masterbatch		
In-line Process					
Combined in-line	\$ -	\$/lb.	Blow, Slit, (Embosse), Print & Sheet		Converter is not yet identified Dupont will not convert.
Blowing					
Gemini Plastics	\$ 0.36	\$/lb.	Integral to in-line process		This process step not optimized
Transamerican Plastics	\$ 0.52	\$/lb.			
Polymer Packaging	\$ 0.35	\$/lb.			
Slitting					
Gemini Plastics	\$ 35.00	\$/hour	Integral to in-line process		This process step not optimized
Machine/Labor rate					
Machine speed	150.0	ft/min	Represents speed of slowest process in-line		
Machine width	45.0	in			
Part width	15.0	in	Assume part no greater than 15" x 15"		
Parts wide	3.0	parts			
Parts per minute (single width)	120.0	parts/min			
Parts per minute on given machine	360.0	parts/min			
Cost per part	\$ 0.00167	\$/part			
Transamerican Plastics					
Machine/Labor rate	\$ 65.00	\$/hour			
Machine speed	150.0	ft/min			
Machine width	45.0	in			
Part width	15.0	in	Assume part no greater than 15" x 15"		
Parts wide	3.0	parts			
Parts per minute (single width)	120.0	parts/min			
Parts per minute on given machine	360.0	parts/min			
Cost per part	\$ 0.00361	\$/part			
Printing					
General Assumptions			Integral to in-line process		This process step not optimized

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Biodegradable Wrap Model

Assumptions:

Assumption	Value	Units	Detail Description	Assumption Confidence	Open items and assignments
Associated Polybag					
Machine/Labor rate	\$ 120.00	\$/hour			
Machine speed	150.0	ft/min			
Machine width	45.0	in			
Part width	15.0	in			
Parts wide	3.0	parts			
Parts per minute (single width)	120.0	parts/min			
Parts per minute on given machine	360.0	parts/min	Assume part no greater than 15" x 15"		
Cost per part	\$ 0.00556	\$/part			
Transamerican Plastics					
Machine/Labor rate	\$ 125.00	\$/hour			
Machine speed	150.0	ft/min			
Machine width	45.0	in			
Part width	15.0	in			
Parts wide	3.0	parts			
Parts per minute (single width)	120.0	parts/min			
Parts per minute on given machine	360.0	parts/min	Assume part no greater than 15" x 15"		
Cost per part	\$ 0.00579	\$/part			
Embossing					
Gemini Plastics			Integral to in-line process		This process step not optimized
Machine/Labor rate	\$ 45.00	\$/hour			
Machine speed	150.0	ft/min			
Machine width	45.0	in			
Part width	15.0	in			
Parts wide	3.0	parts			
Parts per minute (single width)	120.0	parts/min			
Parts per minute on given machine	360.0	parts/min	Assume part no greater than 15" x 15"		
Cost per part	\$ 0.00268	\$/part			
Transamerican Plastics					
Machine/Labor rate	\$ 37.00	\$/hour			
Machine speed	150.0	ft/min			
Machine width	45.0	in			
Part width	15.0	in			
Parts wide	3.0	parts			
Parts per minute (single width)	120.0	parts/min			
Parts per minute on given machine	360.0	parts/min	Assume part no greater than 15" x 15"		
Cost per part	\$ 0.00173	\$/part			
Sheeting					
Associated			Not part of in-line process		This process step not optimized
Machine/Labor rate	\$ 35.00	\$/hour			
Machine speed	63.3	ft/min			
Machine width	45.0	in			

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Biodegradable Wrap Model

Assumptions:

<u>Assumption</u>	<u>Value</u>	<u>Units</u>	<u>Detail Description</u>	<u>Assumption Confidence</u>	<u>Open items and assignments</u>
Part width	15.0	in	Assume part no greater than 15" x 15"		
Parts wide	3.0	parts			
Parts per minute (single width)	66.6	parts/min			
Parts per minute on given machine	199.9	parts/min	100 ppm per lane; 2 lanes		Specific Sheeter equipment exists, so that the Bagger would not need to be modified
Cost per part	\$ 0.00292	\$/part			
Transamerican Plastics					
Machine/Labor rate	\$ 37.00	\$/hour			
Machine speed	50.0	ft/min			
Machine width	45.0	in			
Part width	15.0	in	Assume part no greater than 15" x 15"		
Parts wide	3.0	parts			
Parts per minute (single width)	40.0	parts/min	Sheeting's limiting factor is 'catching' the sheeted wraps as they come off of the machine, i.e. manual limitation		
Parts per minute on given machine	120.0	parts/min			
Cost per part	\$ 0.00514	\$/part			
<u>Minimum Commercial Volume</u>			all prices are FOB Converter		Product design still not finalized.
Inorganics					
Anti-block - SiO2	\$ 0.14	\$/lb.	Randy verified price	95%	
Whitener - TiO2	\$ 0.99	\$/lb.	Randy verified price	95%	
Inorganic Filler - CaCO3	\$ 0.09	\$/lb.	Randy verified price	95%	
Resin					
Biomax 4026 - DuPont (Rigid)	\$ 1.00	\$/lb.	\$1.00 provided by Simon based upon perceived economies with volume	10%	
Ecoflex FBX - BASF (Flexible)	4.80	DM/kg	Provided by H.Schmidt based upon general talks with BASF; up to 30,000MT		
Ecoflex FBX - BASF (Flexible)	\$ 1.00	\$/lb.	Assumes 'delivered price'		
Eastar MW - H	\$ 2.00	\$/lb.	High Grade - Provided by Kishan. Assumes 'delivered price'	90%	
Eastar MW - L	\$ 1.83	\$/lb.	Low Grade - Provided by Kishan. Assumes 'delivered price'	90%	
PLA - Hycail B.V. (Rigid)	\$ 1.00	\$/lb.	Provided by Kishan - verbal quote from Bill Kelly. Hycail U.S. prices not yet available		
Masterbatch Compounding by A. Schulman					
ES4228	\$ 0.75	\$/lb.	Proprietary - A.Schulman Inc.		Randy
% Filler - Assume CaCO3	70%		% of respective Masterbatch		
General Assumptions					
9/19/2005 - 6:48 PM					

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Biodegradable Wrap Model Assumptions:

Assumption	Value	Units	Detail Description	Assumption Confidence	Open items and assignments
Masterbatch Compounding by Biotec					
Bioplast GF 105/30 (Wrap)	7.50	DM/kg	Biotec Sales price = 6.50DM Raw Mat. + 1.5DM Compounding	95%	
Bioplast GF 105/30 (Wrap)	1.55	\$/lb.			
PLA - Germany					
PLA - Germany	6.63	DM/kg	Provided by H. Schmidt - 02/22/01		Can Biotec compound this, or always 3rd party sourced?
Loxamid (Slipping Agent)	1.37	\$/lb.	Provided by H. Schmidt - 02/22/01		
Loxamid (Slipping Agent)	11.80	DM/kg	Provided by H. Schmidt - 02/22/01		
Loxol (Slipping Agent)	2.45	\$/lb.	Provided by H. Schmidt - 02/22/01		
Loxol (Slipping Agent)	5.35	DM/kg	Provided by H. Schmidt - 02/22/01		
K21 (Slipping Agent)	1.11	\$/lb.	Provided by H. Schmidt - 02/22/01		
Masterbatch white	11.48	DM/kg			
Masterbatch white	2.35	\$/lb.			
Masterbatch white	9.00	DM/kg	Provided by H. Schmidt - 02/22/01		
Masterbatch white	1.57	\$/lb.			
Derived Total raw material cost excluding compounding cost					
Bioplast GF 105/30/W20	1.153	\$/lb.			
Ecoflex FBX	0.657	\$/lb.			
PLA	0.389	\$/lb.			
Slipping Agent	0.019	\$/lb.			
Loxamid	0.068	\$/lb.			
Loxol	0.093	\$/lb.			
K21	0.007	\$/lb.			
Masterbatch white	0.085	\$/lb.			
Masterbatch Compounding by Techmer PM					
Ecoflex / 55% CaCO3	1.45	1,000 lbs	Kishan Memo - 11/06/00	95%	Masterbatch compounding costs will remain relatively high without competition
Ecoflex / 64% TiO2/BaSO4	1.85	\$/lb.	Kishan Memo - 11/06/00	95%	
Ecoflex / (Assume) 60% TiO2	1.50	\$/lb.	Kishan Memo - 11/06/00	95%	
Biomax / 61% CaCO3	1.50	\$/lb.	Kishan Memo - 11/06/00	95%	
Biomax / 53% TiO2/BaSO4	1.70	\$/lb.	Kishan Memo - 11/06/00	95%	
Biomax / 50% SiO2	1.62	\$/lb.	Kishan Memo - 11/06/00	95%	
In-line Process					
Combined in-line	-	\$/lb.	Blow, Slit, (Embosse), Print & Sheet	Converter is not yet identified Dupont will not convert.	
Blowing					
Gemini Plastics	0.36	\$/lb.	Integral to in-line process		This process step not optimized
Transamerican Plastics	0.32	\$/lb.			
Polymer Packaging	0.32	\$/lb.			

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Biodegradable Wrap Model

Assumptions:

<u>Assumption</u>	<u>Value</u>	<u>Units</u>	<u>Detail Description</u>	<u>Assumption Confidence</u>	<u>Open items and assignments</u>
Sitting					
Gemini Plastics					
Machine/Labor rate	\$ 36.00	\$/hour	Integral to in-line process		This process step not optimized Rate for higher volumes unknown. Assume same as low volumes
Machine speed	300.0	ft/min			
Machine width	45.0	in	Represents speed of slowest process in-line		Assumes improvement in machine speeds
Part width	15.0	in	Assume part no greater than 15" x 15"		
Parts wide	3.0	parts			
Parts per minute (single width)	240.0	parts/min			
Parts per minute on given machine	720.0	parts/min			
Cost per part	\$ 0.00053	\$/part			
Transamerican Plastics					
Machine/Labor rate	\$ 65.00	\$/hour			Rate for higher volumes unknown. Assume same as low volumes
Machine speed	300.0	ft/min			Assumes improvement in machine speeds
Machine width	45.0	in			
Part width	15.0	in	Assume part no greater than 15" x 15"		
Parts wide	3.0	parts			
Parts per minute (single width)	240.0	parts/min			
Parts per minute on given machine	720.0	parts/min			
Cost per part	\$ 0.00150	\$/part			
Printing					
Associated Polybag					
Machine/Labor rate	\$ 120.00	\$/hour	Integral to in-line process		This process step not optimized
Machine speed	300.0	ft/min			Rate for higher volumes unknown. Assume same as low volumes
Machine width	45.0	in			Assumes improvement in machine speeds
Part width	15.0	in	Assume part no greater than 15" x 15"		
Parts wide	3.0	parts			
Parts per minute (single width)	240.0	parts/min			
Parts per minute on given machine	720.0	parts/min			
Cost per part	\$ 0.00276	\$/part			
Transamerican Plastics					
Machine/Labor rate	\$ 125.00	\$/hour			Rate for higher volumes unknown. Assume same as low volumes
Machine speed	300.0	ft/min			Assumes improvement in machine speeds
Machine width	45.0	in			
Part width	15.0	in	Assume part no greater than 15" x 15"		
Parts wide	3.0	parts			
Parts per minute (single width)	240.0	parts/min			
Parts per minute on given machine	720.0	parts/min			
Cost per part	\$ 0.00289	\$/part			

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Biodegradable Wrap Model

Assumptions:

Assumption	Value	Units	Detail Description	Assumption Confidence	Open items and assignments
Embossing					
Gemini Plastics					
Machine/Labor rate	\$ 45.00	\$/hour			
Machine speed	300.0	ft/min			
Machine width	45.0	in			
Part width	15.0	in			
Parts wide	3.0	parts			
Parts per minute (single width)	240.0	parts/min			
Parts per minute on given machine	720.0	parts/min			
Cost per part	\$ 0.00164	\$/part			
Transamerican Plastics					
Machine/Labor rate	\$ 37.00	\$/hour			
Machine speed	300.0	ft/min			
Machine width	45.0	in			
Part width	15.0	in			
Parts wide	3.0	parts			
Parts per minute (single width)	240.0	parts/min			
Parts per minute on given machine	720.0	parts/min			
Cost per part	\$ 0.00085	\$/part			
Sheeting					
Associated					
Machine/Labor rate	\$ 35.00	\$/hour			
Machine speed	63.3	ft/min			
Machine width	45.0	in			
Part width	15.0	in			
Parts wide	3.0	parts			
Parts per minute (single width)	63.6	parts/min			
Parts per minute on given machine	190.9	parts/min			
Cost per part	\$ 0.00292	\$/part			
Transamerican Plastics					
Machine/Labor rate	\$ 37.00	\$/hour			
Machine speed	50.0	ft/min			
Machine width	45.0	in			
Part width	15.0	in			
Parts wide	3.0	parts			
Parts per minute (single width)	40.0	parts/min			

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Biodegradable Wrap Model

Assumptions:

<u>Assumption</u>	<u>Value</u>	<u>Units</u>	<u>Detail Description</u> Sheeting's limiting factor is 'catching' the sheeted wraps as they come off of the machine, i.e. manual limitation	<u>Assumption Confidence</u>	<u>Open items and assignments</u>
Parts per minute on given machine	123.0	parts/min			
Cost per part	\$ 0.00514	\$/part			
High Commercial Volume					
Inorganics					Product design still not finalized.
Anti-block - SiO2	\$ 0.14	\$/lb.	Randy verified price	95%	
Whitener - TiO2	\$ 0.99	\$/lb.	Randy verified price	95%	
Inorganic Filler - CaCO3	\$ 0.09	\$/lb.	Randy verified price	95%	
Resin					
Biomax 4026 - DuPont (Rigid)	\$ 1.00	\$/lb.	\$1.00 provided by Simon based upon perceived economies with volume	10%	
Ecoflex FBX - BASF (Flexible)	4.60	DM/kg	Provided by H.Schmidt based upon general talks with BASF; up to 30,000MT		
Ecoflex FBX - BASF (Flexible)	\$ 0.95	\$/lb.	Assumes 'delivered price'		
Eastar MW - H	\$ 2.00	\$/lb.	High Grade - Provided by Kishan. Assumes 'delivered price'	90%	
Eastar MW - L	\$ 1.93	\$/lb.	Low Grade - Provided by Kishan. Assumes 'delivered price'	90%	
PLA - Hycail B.V. (Rigid)	\$ 1.90	\$/lb.	Provided by Kishan - verbal quote from Bill Kelly. Hycail U.S. prices not yet available		
Masterbatch Compounding by A. Schulman ES4228	\$ -	\$/lb.	Proprietary - A. Schulman Inc.		Randy
% Filler - Assume CaCO3	70%		% of respective Masterbatch		
Masterbatch Compounding by Biotec					
Bioplast GF 105/30 (Wrap)	\$ 6.90	DM/kg	Biotec Sales price = 4.50DM Raw Mat. + 1.5DM Compounding	50%	
Bioplast GF 105/30 (Wrap)	\$ 1.24	\$/lb.			
PLA - Germany	\$ 6.63	DM/kg	Provided by H.Schmidt - 02/22/01		
PLA - Germany	\$ 1.37	\$/lb.			
Loxamid (Slipping Agent)	\$ 11.80	DM/kg	Provided by H.Schmidt - 02/22/01		
Loxamid (Slipping Agent)	\$ 2.45	\$/lb.			
Loxol (Slipping Agent)	\$ 5.35	DM/kg	Provided by H.Schmidt - 02/22/01		
Loxol (Slipping Agent)	\$ 1.11	\$/lb.			
K21 (Slipping Agent)	\$ 11.48	DM/kg	Provided by H.Schmidt - 02/22/01		
K21 (Slipping Agent)	\$ 2.35	\$/lb.			

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Biodegradable Wrap Model

Assumptions:

Assumption	Value	Units	Detail Description	Assumption Confidence
Masterbatch white	9.00	DM/kg	Provided by H.Schmidt - 02/22/01	Open items and assignments
Masterbatch white	1.57	\$/lb.		Can Biotech compound this, or always 3rd ply sourced?
Bioplast GF 105/30W20	1.126	\$/lb.	Derived Total raw material cost excluding compounding cost	
Ecoflex FBX	0.629	\$/lb.		
PLA	0.359	\$/lb.		
Slipping Agent	0.019	\$/lb.		
Loxamid	0.006	\$/lb.		
Loxiol	0.003	\$/lb.		
K21	0.007	\$/lb.		
Masterbatch white	0.089	\$/lb.		
Masterbatch Compounding by Techmer PM		40000 lbs		Masterbatch compounding costs will remain relatively high without competition
Ecoflex / 55% CaCO3	-	\$/lb.	Assumes cocktail produced at primary	
Ecoflex / 64% TiO2/BaSO4	-	\$/lb.	Assumes cocktail produced at primary	
Ecoflex / (Assume) 60% TiO2	-	\$/lb.	Assumes cocktail produced at primary	
Biomax / 61% CaCO3	-	\$/lb.	Assumes cocktail produced at primary	
Biomax / 53% TiO2/BaSO4	-	\$/lb.	Assumes cocktail produced at primary	
Biomax / 50% SiO2	-	\$/lb.	Assumes cocktail produced at primary	
In-line Process				Converter is not yet identified Dupont will not convert.
Combined in-line	0.30	\$/lb.	Blow, Slit, (Embosse), Print & Sheet	This process step not optimized
Blowing				
Gemini Plastics	-	\$/lb.	Integral to in-line process	
Transamerican Plastics	-	\$/lb.	In-line Process precludes this cost	
Polymer Packaging	-	\$/lb.	In-line Process precludes this cost	
Slitting				
Gemini Plastics			Integral to in-line process	This process step not optimized
Machine/Labor rate		\$/hour	In-line Process precludes this cost	Rate for higher volumes unknown. Assume same as low volumes
Machine speed	300.0	ft/min	Represents speed of slowest process in-line	Assumes improvement in machine speeds
Machine width	45.0	in		
Part width	15.0	in	Assume part no greater than 15" x 15"	
Parts wide	3.0	parts		
Parts per minute (single width)	240.0	parts/min		
Parts per minute on given machine	720.0	parts/min		
Cost per part	-	\$/part		
Transamerican Plastics				

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Biodegradable Wrap Model

Assumptions:

<u>Assumption</u>	<u>Value</u>	<u>Units</u>	<u>Detail Description</u>	<u>Assumption Confidence</u>	<u>Open items and assignments</u>
Machine/Labor rate	\$	\$/hour	In-line Process precludes this cost	Rate for higher volumes unknown. Assume same as low volumes Assumes improvement in machine speeds	Rate for higher volumes unknown. Assume same as low volumes Assumes improvement in machine speeds
Machine speed	300.0	ft/min			
Machine width	45.0	in			
Part width	15.0	in			
Parts wide	3.0	parts	Assume part no greater than 15" x 15"		
Parts per minute (single width)	240.0	parts/min			
Parts per minute on given machine	720.0	parts/min			
Cost per part	\$	\$/part			
Printing					
Associated Polybag					
Machine/Labor rate			Integral to in-line process	This process step not optimized	
Machine speed	\$	\$/hour			
Machine width	300.0	ft/min	In-line Process precludes this cost	Rate for higher volumes unknown. Assume same as low volumes Assumes improvement in machine speeds	Rate for higher volumes unknown. Assume same as low volumes Assumes improvement in machine speeds
Part width	45.0	in			
Parts wide	15.0	in			
Parts per minute (single width)	3.0	parts	Assume part no greater than 15" x 15"		
Parts per minute on given machine	240.0	parts/min			
Cost per part	720.0	parts/min			
	\$	\$/part			
Transamerican Plastics					
Machine/Labor rate	\$	\$/hour	In-line Process precludes this cost	Rate for higher volumes unknown. Assume same as low volumes Assumes improvement in machine speeds	Rate for higher volumes unknown. Assume same as low volumes Assumes improvement in machine speeds
Machine speed	300.0	ft/min			
Machine width	45.0	in			
Part width	15.0	in			
Parts wide	3.0	parts	Assume part no greater than 15" x 15"		
Parts per minute (single width)	240.0	parts/min			
Parts per minute on given machine	720.0	parts/min			
Cost per part	\$	\$/part			
Embossing					
Gemini Plastics					
Machine/Labor rate			Integral to in-line process	This process step not optimized	
Machine speed	\$	\$/hour			
Machine width	300.0	ft/min	In-line Process precludes this cost	Rate for higher volumes unknown. Assume same as low volumes Assumes improvement in machine speeds	Rate for higher volumes unknown. Assume same as low volumes Assumes improvement in machine speeds
Part width	45.0	in			
Parts wide	15.0	in			
Parts per minute (single width)	3.0	parts	Assume part no greater than 15" x 15"		
Parts per minute on given machine	240.0	parts/min			
Cost per part	720.0	parts/min			
	\$	\$/part			
Transamerican Plastics					
Machine/Labor rate					
Machine speed	\$	\$/hour			
Machine width	300.0	ft/min			
Part width	45.0	in			
Parts wide	15.0	in			
Parts per minute (single width)	3.0	parts			
Parts per minute on given machine	240.0	parts/min			
Cost per part	720.0	parts/min			
	\$	\$/part			

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Biodegradable Wrap Model

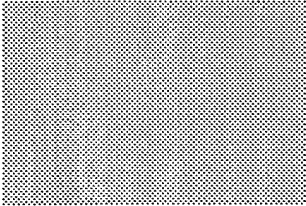
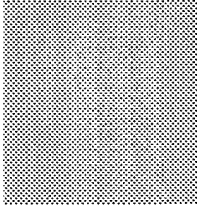
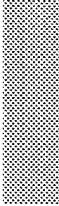
Assumptions:

Assumption	Value	Units	Detail Description	Assumption Confidence	Open items and assignments
Machine/Labor rate	\$	\$/hour	In-line Process precludes this cost		Rate for higher volumes unknown. Assume same as low volumes
Machine speed	300.0	ft/min			
Machine width	45.0	in			
Part width	15.0	in	Assume part no greater than 15" x 15"		Assumes improvement in machine speeds
Parts wide	3.0	parts			
Parts per minute (single width)	240.0	parts/min			
Parts per minute on given machine	720.0	parts/min			
Cost per part	\$	\$/part			
Sheeting Associated			Not part of in-line process		This process step not optimized
Machine/Labor rate	\$	\$/hour			
Machine speed	53.3	ft/min			
Machine width	45.0	in			
Part width	15.0	in	Assume part no greater than 15" x 15"		
Parts wide	3.0	parts			
Parts per minute (single width)	66.6	parts/min			
Parts per minute on given machine	199.9	parts/min			
Cost per part	\$	\$/part			
Transamerican Plastics					Rate for higher volumes unknown. Assume same as low volumes
Machine/Labor rate	\$	\$/hour	In-line Process precludes this cost		
Machine speed	50.0	ft/min			
Machine width	45.0	in			
Part width	15.0	in	Assume part no greater than 15" x 15"		
Parts wide	3.0	parts			
Parts per minute (single width)	40.0	parts/min			
Parts per minute on given machine	120.0	parts/min	Sheeting's limiting factor is 'catching' the sheeted wraps as they come off of the machine, i.e. manual limitation		
Cost per part	\$	\$/part			
V. Freight costs:					
Between converters (Truck)	\$	\$/lb		75%	Generally accepted rate
Germany to Baltimore - 40' Container					
Duty	7.00%	% of Value	T.T.C. - 02/16/01 quote	95%	Randy sourced this quote
Customs Entry	145.00	\$/40' cntnr	T.T.C. - 02/16/01 quote	95%	Randy sourced this quote
Ocean Freight	3,650.00	\$/40' cntnr	T.T.C. - 02/16/01 quote	95%	Randy sourced this quote
Trucking	325.00	\$/40' cntnr	T.T.C. - 02/16/01 quote	95%	Randy sourced this quote
Messenger	15.00	\$/40' cntnr	T.T.C. - 02/16/01 quote	95%	Randy sourced this quote

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Biodegradable Wrap Model

Assumptions:

	<u>Assumption</u>	<u>Value</u>	<u>Units</u>	<u>Detail Description</u>	<u>Assumption Confidence</u>	<u>Open items and assignments</u>
VI. Energy costs:			\$/k pieces			Toll manufacturing
VII. Labor Rates:						
Skill Level:	1					Toll manufacturing
	2					
	3					
	4					
	5					
	6					
	7					
	8					
	9					
	10					
	11					
Salary Level:	1					
	2					
	3					
	4					
	5					
	6					
	7					
Fringe Benefits						
OT premium - average						
VIII. Direct Labor Staffing						Toll manufacturing
			Heads/line	Requires Skill level:		
VIII. Nameplate capacity						
Products/platen		27,540		product per hour		
Cycle time (sec)		32 pieces				
# presses/line (module)		67 sec				
# of Lines		8 presses				
		2 lines				
IX. Planned Operating Hours						Toll manufacturing
X. Quality Expectations (material efficiency) at each point for potential loss due to imperfect parts						Toll manufacturing
XI. Uptime Expectations for each unit operation (operating efficiency)						Toll manufacturing

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Biodegradable Wrap Model

Assumptions:

<u>Assumption</u>	<u>Value</u>	<u>Units</u>	<u>Detail Description</u>	<u>Assumption Confidence</u>	<u>Open items and assignments</u>
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Biodegradable Wrap Model

Assumptions:

<u>Assumption</u>		<u>Value</u>	<u>Units</u>	<u>Detail Description</u>	<u>Assumption Confidence</u>	<u>Open items and assignments</u>
Manufacturing Overhead						
XII.	Indirect Staffing		Heads/line	Requires Skill level:		Toll manufacturing
XIII.	Other Semi Variable Plant Overhead Percent in lieu of \$ detail	0.0%				Toll manufacturing
XIV.	Fixed Plant Overhead Plant management:		Heads/line	Requires Salary level:		Toll manufacturing
SG&A		0%	%			
<u>Capital</u>						
CapEx Contingency		0%				Toll manufacturing
Capital Installation		0%				Toll manufacturing
Capital Life		0 years		Straight line	100%	Toll manufacturing
Assumptions working capital						
-inventory materials 2 weeks					0%	
-inventory finished goods 2 weeks					0%	
-trade receivables 1 month					0%	
-trade payables 1 month					0%	

EarthShell Corporation
Biodegradable Wrap Model

Sandwich Wrap L - PLA/Ecoflex - 50 micron
50% PLA, 15% Ecoflex / 35% Filler - ES4338
15" x 15"

	Weight Mix ratios Fin.Prod.	Mstr Batch mat req'd g/piece	Minimum Commercial Volume		High Commercial Volume	
			Price/LB	Cost/1000	Price/LB	Cost/1000
Raw Materials:						
PLA - Hycail B.V.	50.0% (a)	(b)	1.00	0.00	1.00	5.62
Ecoflex FBX	15.0% (a)	0.77 (b)	1.00	1.68	0.95	1.61
Filler - Assume CaCO2	35.0% (a)				0.14	0.55
Total Raw Materials	100.0%			1.68		7.78
Formulation:						
PLA - Hycail B.V.	50.0%	2.55 (b)	1.00	5.62	0.00	0.00
Masterbatch Compounding (cost incl. inorganics): PaperMatch ES4338	50.0%	2.55 (b)	0.75	4.22	0.00	0.00
Total Formulation	100.0%	5.10		9.84		0.00
Subtotal Raw Mat./Formulation				11.52		7.78
Combined film converting process		5.10	0.00	0.00	0.30	3.37
Separate converting processes						
Blowing:						
Gemini		5.10	0.36	4.05	0.00	0.00
Printing:						
Associated				2.78		0.00
Embossing:						
No				0.00		0.00
Sheeting/Slitting:						
Associated				2.92		0.00
Separate converting processes				9.74		0.00
Cost of Manufacture				21.26		11.15
Markup	30%			6.38		3.35
Target Selling Price				27.64		14.50

Notes:

- (a) Used for calculating High Commercial Volume cost per 1000; i.e. single compounding step.
(b) Used for calculating Minimum & Current Commercial Volume cost per 1000; i.e. dual compounding step.

EarthShell Corporation
Biodegradable Wrap Model

Sandwich Wrap L - Biomax/Eastar - 50 micron
50% Biomax - 4026, 15% Eastar MW / 35% Filler - ES4338
15" x 15"

	Weight Mix ratios Fin.Prod.	Mstr Batch mat req'd g/piece	Minimum Commercial Volume		High Commercial Volume	
			Price/LB	Cost/1000	Price/LB	Cost/1000
Raw Materials:						
Biomax 6926	50.0% (a)	(b)	1.00	0.00	1.00	5.62
Eastar MW - H	15.0% (a)	0.77 (b)	2.00	3.37	2.00	3.37
Filler - Assume CaCO2	35.0% (a)				0.14	0.55
Total Raw Materials	100.0%			3.37		9.55
Formulation:						
Biomax 6926	50.0%	2.55 (b)	1.00	5.62	0.00	0.00
Masterbatch Compounding (cost incl. inorganics): PaperMatch ES4338	50.0%	2.55 (b)	0.75	4.22	0.00	0.00
Total Formulation	100.0%	5.10		9.84		0.00
Subtotal Raw Mat/Formulation				13.21		9.55
Combined film converting process		5.10	0.00	0.00	0.30	3.37
Separate converting processes						
Blowing:						
Genfin		5.10	0.36	4.05	0.00	0.00
Printing:						
Associated				2.78	0.00	0.00
Embossing:						
No				0.00	0.00	0.00
Sheeting/Slitting:						
Associated				2.92	0.00	0.00
Separate converting processes				9.74		0.00
Cost of Manufacture				22.95		12.92
Markup	30%			6.89		3.88
Target Selling Price				29.84		16.79

Notes:

- (a) Used for calculating High Commercial Volume cost per 1000; i.e. single compounding step.
(b) Used for calculating Minimum & Current Commercial Volume cost per 1000; i.e. dual compounding step.

EarthShell Corporation
Biodegradable Wrap Model

Sandwich Wrap L - Biomax/Ecoflex - 50 micron
50% Biomax - 4026, 15% Ecoflex / 35% Filler - ES4338
15" x 15"

	Weight Mix ratios Fin.Prod.	Mstr Batch mat req'd g/piece	Minimum Commercial Volume		High Commercial Volume	
			Price/LB	Cost/1000	Price/LB	Cost/1000
Raw Materials:						
Biomax 6926	50.0% (a)	(b)	1.00	0.00	1.00	5.62
Ecoflex FBX	15.0% (a)	0.77 (b)	1.00	1.68	0.95	1.61
Filler - Assume CaCO2	35.0% (a)				0.14	0.55
Total Raw Materials	100.0%			1.68		7.78
Formulation:						
Biomax 6926	50.0%	2.55 (b)	1.00	5.62	0.00	0.00
Masterbatch Compounding (cost incl. inorganics): PaperMatch ES4338	50.0%	2.55 (b)	0.75	4.22	0.00	0.00
Total Formulation	100.0%	5.10		9.84		0.00
Subtotal Raw Mat./Formulation				11.52		7.78
Combined film converting process		5.10	0.00	0.00	0.30	3.37
Separate converting processes						
Blowing:						
Gemini		5.10	0.36	4.05	0.00	0.00
Printing:						
Associated				2.78		0.00
Embossing:						
No				0.00		0.00
Sheeting/Sitting:						
Associated				2.92		0.00
Separate converting processes				9.74		0.00
Cost of Manufacture				21.26		11.15
Markup	30%			6.38		3.35
Target Selling Price				27.64		14.50

Notes:

- (a) Used for calculating High Commercial Volume cost per 1000, i.e. single compounding step.
(b) Used for calculating Minimum & Current Commercial Volume cost per 1000; i.e. dual compounding step.

EarthShell Corporation
Biodegradable Wrap Model

Sandwich Wrap A - Biomax/Ecoflex, printed, 30 micron

Ecomax 20/80, 3% SiO2, 5% TiO2, 25% CaCO2 filled, white, printed 4 colors, 30 micron
15" x 15"

	Weight Mix ratios Fin.Prod.	Mstr Batch mat req'd g/piece	Minimum Commercial Volume		High Commercial Volume	
			Price/LB	Cost/1000	Price/LB	Cost/1000
Raw Materials:						
Biomax 6926	53.6% (a)	0.18 (b)	1.00	0.40	1.00	7.21
Ecoflex FBX	13.4% (a)	1.72 (b)	1.00	3.77	0.95	1.72
Anti-block - SiO2	3.0% (a)				0.14	0.06
Whitener - TiO2	5.0% (a)				0.99	0.67
Inorganic Filler - CaCO3	25.0% (a)				0.09	0.30
Total Raw Materials	100.0%			4.18		9.95
Formulation:						
Biomax 6926	50.2%	1.84 (b)	1.00	4.06	0.00	0.00
Ecoflex FBX	13.4%	0.82 (b)	1.00	1.79	0.00	0.00
Masterbatch Compounding (cost incl. inorganics):						
Biomax / 50% SiO2	6.0%	0.37 (b)	1.62	1.31	0.00	0.00
Biomax / 53% TiO2/BaSO4	9.4%	0.58 (b)	1.70	2.16	0.00	0.00
Biomax / 61% CaCO3	41.0%	2.50 (b)	1.50	8.27	0.00	0.00
Total Formulation	100.0%	5.10		17.58		0.00
Subtotal Raw Mat./Formulation				21.76		9.95
Combined film converting process		6.10	0.00	0.00	0.30	4.03
Separate converting processes						
Blowing:						
Genfin		6.10	0.36	4.84	0.00	0.00
Printing:						
Associated				2.78	0.00	0.00
Embossing:						
Nc				0.00	0.00	0.00
Sheeting/Slitting:						
Associated				2.92	0.00	0.00
Separate converting processes				10.54		0.00
Cost of Manufacture				32.30		13.99
Markup	30%			9.69		4.20
Target Selling Price				41.99		18.18

Notes:

- (a) Used for calculating High Commercial Volume cost per 1000; i.e. single compounding step.
(b) Used for calculating Minimum & Current Commercial Volume cost per 1000; i.e. dual compounding step.